

INFRARED SCENE PROJECTION NEWSLETTER

“Projecting and Mobilizing the IR Frontier”

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DYNAMIC INFRARED SCENE PROJECTOR (DIRSP) SYSTEM INTEGRATION

System integration for the DIRSP is currently on-going at Mission Research Corporation (MRC) Logan, UT, facility. Craig Ward (MRC, Logan) is leading the system integration activities there.

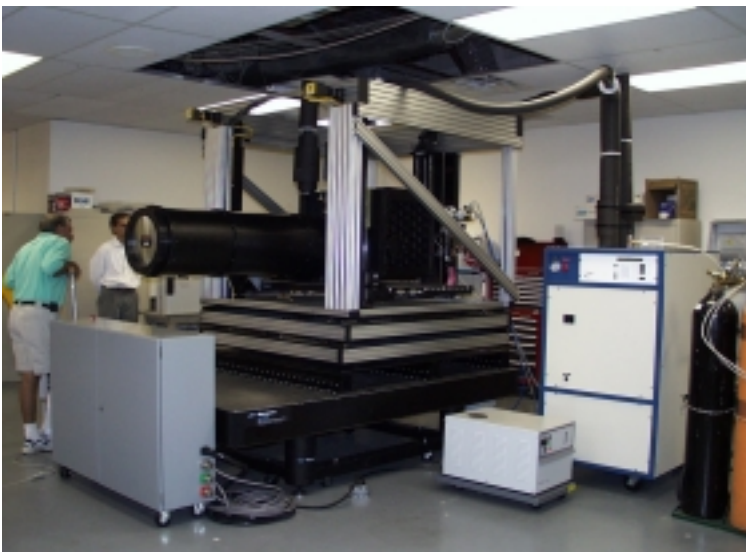


Figure 1. DIRSP System Integration, MRC, Logan, UT

The 5:1 continuous zoom refractive Projection Optics Subsystem (POS), with focal lengths ranging from 225 mm to 1125 mm, has been finally delivered on 1 July 1999 by Diversified Optics, Inc. (DIOP). The front lens AMTIR fabrication, with the extra risk mitigation steps, proved to be successful the second time around. Figure 1 and 2 below show the zoom portion of the POS.



Figure 2. DIRSP POS, Zoom, Side View

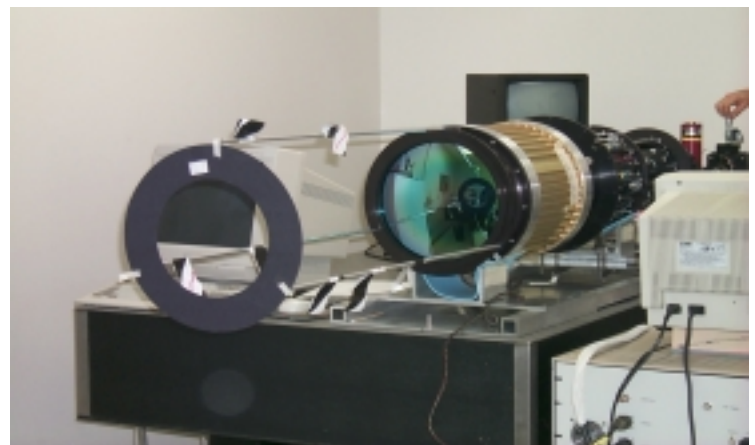


Figure 3. DIRSP POS, Zoom, Front View

Honeywell Technology Center (HTC) has also delivered the phase III science grade arrays. Redstone Technical Test Center (RTTC) has played a vital role in analyzing and characterizing these arrays. Three arrays for the DIRSP system have been selected. "On" pixels on these three arrays were removed by HTC by laser trimming them.

Contract re-direction to complete the program is also in place in July 1999. With this contract modification, MRC will complete final acceptance of the DIRSP system after successful completion of Factory Acceptance Testing. Currently, this is scheduled for late October 1999. The DIRSP system will then be disassembled, packed, shipped to RTTC, and re-assembled at RTTC, under a Time and Material (T&M) effort of the contract. The DIRSP Initial Operational Capability is expected to be in early 2Q FY00.

DIRSP ENGINEERING GRADE ARRAY (DEGA) DEMONSTRATION

As mentioned previously in the last newsletter, the DEGA set-up has been invaluable in demonstrating the IR scene projection technology, concept and usage. This past quarter, the DEGA has again fulfilled that purpose.

★ From 12 through 15 April 1999, the DIRSP was exhibited using the DEGA at the NATO Land Group 6 Demonstration at FT A.P. Hill, VA. The following paragraphs are taken from Eddie Burroughs (RTTC) trip report dated 15 April 1999:

Land Group 6 covers battlefield surveillance, target acquisition, counter-surveillance and electronic warfare.

PM NV/RSTA (Night Vision/Reconnaissance Surveillance and Target Acquisition) hosted a structured technology demonstration for the NATO Armaments Group (Land Group 6) at Fort A.P. Hill, VA. Five countries participated in the activities: Canada, France, Germany, United Kingdom and the United States. The primary purpose of the NATO LG6 structured technology demonstration was to demonstrate the latest technologies associated with electro-optical sensors and

camouflage/concealment/deception (CCD) devices. The participants demonstrated first and second generation FLIRs, second and third generation image intensifiers, multi-sensor suites, laser rangefinders, as well as camouflage/concealment/deception devices.

Various individual kiosks/booths were also set up for demonstrations of national technology advances. The DIRSP engineering grade array (DEGA) was demonstrated in one of the technology kiosks throughout the entire exercise.



Figure 4. DEGA Booth at FT A.P. Hill, VA



Figure 5. Henry Lastra (PD) showing the DEGA to COL Russell (PM ITTS)

During the exercises, numerous static and moving vehicles and personnel were positioned at various ranges and times of day for presentation to the sensors. Along

with camouflage nets, dust and fog-oil obscurants were also dispensed at various times to evaluate the sensor and CCD effectiveness. Passive combat ID panels were also installed on some of the targets to demonstrate cost-effective techniques to avoid fratricide.

Throughout the activities, high-ranking Army officers and staff members were flown in via helicopter to view the technologies. Members of the press (e.g. CNN) were also present for interviews, pictures and video taping of the event.

LTG Kern, Mr. Paul Hoeper, Mr. Keith Charles, Ms. Elenor Spector, Mr. Harold Passini, MG Gust, Mr. Ed Bair and many other Army general officers and executive officials were able to see the STRICOM/TECOM DIRSP technology. Each one of them seemed duly impressed with the DIRSP capability and excited about future applications of this technology. LTG Kern specifically noted that the phase I MIRSP plans to support the Comanche FLIR integration was very good news. Mr. Passini (Dir OEC) also agreed to support the DIRSP efforts by responding to our requests as needed. The British liaison from the embassy seemed very determined to see that the DIRSP gets scoped into the Future Scout/Tracer program. He made notes to follow up with POCs in the joint program office as well as the contractor consortium. It was a great opportunity for good visibility.

★ From FT A.P. Hill, VA, a team from RTTC and ERC, Inc., led by Richard Brown, David Anderson and Tom Kelly, transported the DEGA to Aberdeen Test Center (ATC) in Aberdeen Proving Ground (APG), MD. Below is a summary of the demonstration provided by Don Levin from ATC:

A demonstration of the DEGA was conducted 19 through 21 April at ATC. Building 269B at Trench Warfare was used ...

Equipment setup was done on 19 April.

On 20 April, a Bradley with second Generation FLIR, and standard sight and Commander's Independent Thermal Viewer (CITV) was tested. Standard RS170 video output from the Bradley was recorded on VCR.

A trained APG gunner, looking at two projected targets, tracked one target using Bradley's Automatic Tracker mode and manually tracked the other target. This exercise was repeated with similar results. The main gun on the Bradley was removed during Auto tracking to prevent equipment damage.



Figure 6. From left to right: Don Levin (ATC), Tom Kelly (ERC/RTTC) and Richard Brown (RTTC) aligning the DEGA to the Bradley sensor

On 21 April, an M1A2 tank with gen I and CITV FLIR was tested. Unlike the Gen II, this older FLIR does not have video output other than optical display to the gunner. Alignment with DEGA was difficult because the tank operator could not adjust DEGA, and DEGA operator could not see the FLIR output.



Figure 7. DEGA projecting imagery into the M1A2 1st Generation FLIR sensor

Lessons learned:

Note that DEGA and projector are used to imply IR scene projection equipment.

1. Despite large distances between DEGA and Unit Under Test (UUT) (M1 or Bradley) good image quality was observed in the FLIR in both M1 and Bradley standard and CITV. Distances from DEGA to FLIR are:

	<u>Standard</u>	<u>CITV</u>
M1	66"	54
Bradley	54	4

Although image quality was good, it is desirable to decrease distance between DEGA and FLIR. RTTC should test this using IBAS FLIR in their lab.

2. Alignment on M1 standard FLIR could not be completed because the projection optics was supported by a very wide optical breadboard. The board interfered with the tank gunner scope, which projects out next to the main gun. Pathfinder MIRSP should extend optics 20 to 30 inches beyond its support surface.

3. The wide, flat platform, raised vertically by a fork lift truck, is a poor way to test DEGA. Forks droop when the engine is off. Forks jerk when truck gears are engaged, mechanically disturbing DEGA. Personnel cannot stand on platform or it drops. A better approach is to build, perhaps from wood, a stand about 5 ft high, with additional 1 ft high incremental stand, to support personnel and DEGA or MIRSP for M1 and Bradley.

4. A joystick to remotely control all projection optical alignments is required for use in the M1 tank. Lack of video output from tank requires remote control.

5. DEGA/MIRSP must have ability to project cross hairs the same size as M1 or Bradley. Operator can align UUT with projector by overlaying cross hairs.

6. Equipment was subjected to shock by the fork lift truck, and hoses cooled to -35C were moved around a lot, and performed well.

Visitors to the demonstration, all from ATC, included William Baetz, Test director from the Fire Control Team, Michael Zwiebel, Instrumentation Development Team Leader, and Frank Carlen, Sr Scientist from our Aberdeen Center for Sensing Technology.

★ During the week of 14 June 1999, the DEGA was demonstrated at the Simulation, Test and Evaluation Process (STEP) Exposition in conjunction with Army Test and Evaluation (T&E) Days held at the V. Braun Center in Huntsville, AL. Again, numerous VIPs visited the booth to see the IR scene projector's capabilities.

★ From 26 July through 6 August 1999, the DEGA was demonstrated at the Aviation Technical Test Center (ATTC), FT Rucker, AL. Hands-on training was provided to ATTC personnel to familiarize them on how to operate and maintain an IR scene projector; ATTC will be the recipient of the MIRSP Phase I system that is currently being developed by RTTC. The DEGA was tested using an AGEMA IR sensor and was also demonstrated by projecting imagery into the Pilotage Night Vision System (PNVS). Only a small portion of the PNVS FOV could be seen due to the PNVS having such a large FOV. Originally, the DEGA was going to test the Comanche sensor on the Apache AH-64A. However, the Apache was grounded at that time due to unforeseen technical problems.

Lessons learned: During the two weeks, the DEGA was exposed to a kind of environment that the MIRSP Phase I will experience (i.e., semi-protected hangar type environment). The DEGA functioned well amidst the heat and humidity, noise generated from helicopters, electro-magnetic interference and radar scans.

MOBILE INFRARED SCENE PROJECTOR (MIRSP) PHASE I

Preliminary Design Review (PDR) for the MIRSP Phase I system was held at RTTC on 20 May 1999. A separate POS PDR was held at JANOS Technology, Inc. earlier in April 1999. Mini Critical Design Reviews (CDRs) on each subsystem were held throughout the month of August 1999, culminating in a successful system CDR that was held on 26 August 1999 at RTTC. Fabrication will begin in September 1999. The scope of the program has been expanded to include the transport vehicle (see Figure 8 below) and the purchase of a Santa Barbara Infrared, Inc. (SBIR) 512 x 512 array for risk mitigation purposes of the MIRSP Phase I and objective Phase II programs. The transport vehicle (see Figure 9 below) will house the static equipment associated with the system and will also provide a space for the mobile equipment (see Figure 10) such that it can be transported from one place to another. Currently the MIRSP Phase I program is on track in terms of cost, schedule and performance. Expected IOC is still on target for 4Q FY00.

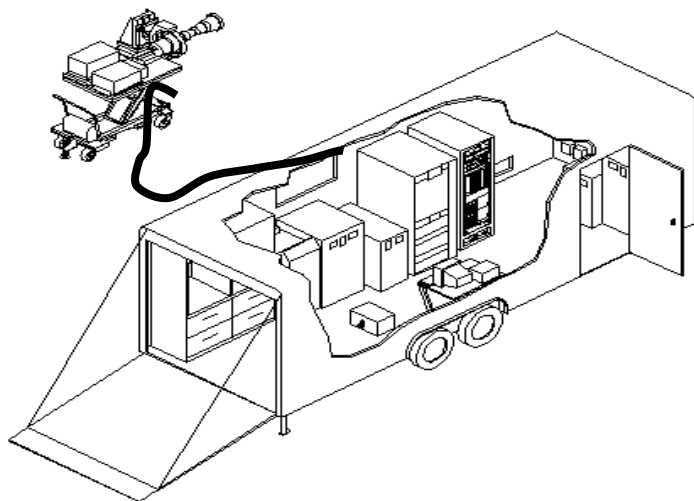


Figure 8. MIRSP Phase I System

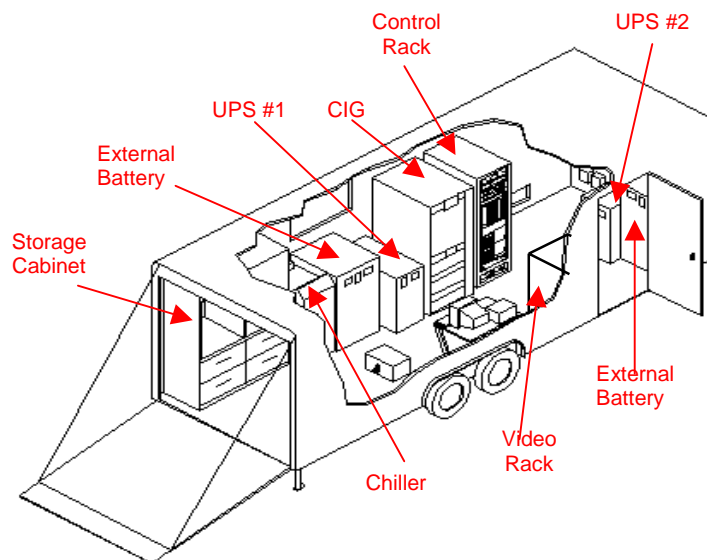


Figure 9. MIRSP Phase I Transport Vehicle with Static Equipment

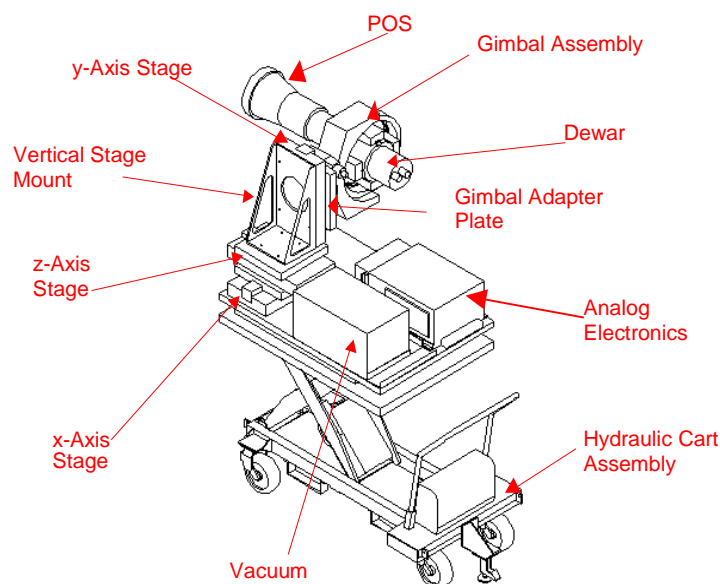


Figure 10. MIRSP Phase I Mobile Equipment

INFRARED SENSOR STIMULATOR (IRSS) PROGRAM

The IRSS program recently held their In-Process Review (IPR) at Comptek Amherst Systems, Inc. in Buffalo, NY, on 13 July 1999. The Army continues to work together with the IRSS team to leverage technologies and lessons learned in the IR scene projection area. The IRSS program is a joint Navy/Air Force Central Test and Evaluation Investment Program (CTEIP) to provide installed systems test capability for IR/EO sensors at the Air Combat Environment T&E Facility (ACETEF) and ATIC. Mr. Tom Joyner (ACETEF, Naval Air Warfare Center – Aircraft Division, Patuxent River, MD) is the Program Manager and Mr. Keem Thiem (Air Force Flight Test Center, Edwards Air Force Base, CA) is the Deputy Program Manager. The prime contractor for IRSS is Comptek Amherst Systems. The IRSS system is comprised of six subsystems including the following:

- Modeling and Database Subsystem (MDBS)
- Simulation Control Subsystem (SCS)
- Scenario Development Subsystem (SDS)
- Scene Generation Subsystem (SGS)
- IR Point Source Projection Subsystem (IRPSP)
- Signal Injection Subsystem (SIS)

The first four subsystems support scene simulation and the last two support the free space projection and signal injection of the scene to the unit-under-test. All of the subsystems, except for the IRPSP, are being developed by Comptek Amherst Systems; The IRPSP subsystem is being developed by SPARTA Corporation in Huntsville, AL, using Santa Barbara Infrared (SBIR) 512 x 512 resistor array and projection optics from DIOP. The basis for the SIS is Comptek Amherst Universal Programmable Interface (UPI). IRSS FOC is projected to be in 4Q FY00. Full image scene projection capability is planned for future upgrade.

1024 RESISTOR ARRAY DEVELOPMENT CONFERENCE

The 1024 x 1024 resistor array development conference was held at Eglin Air Force Base on 4 May 1999. The meeting was hosted by Bob Stockbridge and Lee Murrer from Air Force Research Laboratory Munitions Directorate Advanced Guidance Division Guidance Simulation Branch (AFRL/MNGG). The purpose of the conference was to get all the triservice and other government agencies such as Defense Threat Reduction Agency (DTRA) involved in this development such that requirements can be gathered, funding and schedule planned and identified. Currently, AFRL/MNGG has two parallel efforts to be carried through PDR with Honeywell Technology Center (HTC) and Santa Barbara Infrared/Indigo Systems team to design a 1024 x 1024 resistor array. Santa Barbara Infrared/Indigo Systems presented their design on 15 July 1999. HTC will follow soon. Pending funding from its BMDO sponsor, AFRL/MNGG is projecting a 2Q FY00 award for this 1024 x 1024 array development and fabrication while pursuing internal development of interface and drive electronics to support these projectors.

UPCOMING EVENTS

- ★ DIRSP Factory Acceptance Testing, October 1999, at MRC, Logan, UT.
- ★ MIRSP Phase I In-Process Review (IPR), October 1999.
- ★ International Test & Evaluation Association (ITEA) Workshop, “Converting T&E Into Training”, 8 – 10 November 1999, Koloa, Kauai, Hawaii.
- ★ Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), 29 November – 2 December 1999, Orlando, FL.

ABSTRACTS/PAPER SUBMISSION

- ★ Eddie Burroughs (RTTC), Richard Brown (RTTC), Henry Lastra (STRICOM) and Cisca Vuong (STRICOM) submitted a paper titled "Infrared Scene Projection, Synthetic Solution for Testing and Training FLIR Systems", to the I/ITSEC, 29 November – 2 December 1999, Orlando, FL. The paper was accepted by the reviewing committee and will be presented at the conference in the Emerging Concept Session.
- ★ Eddie Burroughs (RTTC), Richard Brown (RTTC), Henry Lastra (STRICOM) and Cisca Vuong (STRICOM) submitted an abstract titled "Trade-Offs in Designing a Mobile Infrared Scene

Projector", to the ITEA Workshop, 8 – 10 November 1999, Koloa, Kauai, Hawaii. The abstract was accepted by the reviewing committee and will be presented as a poster paper during the workshop.

- ★ Eddie Burroughs (RTTC), Ken LeSueur (RTTC), Henry Lastra (STRICOM) and Cisca Vuong (STRICOM) submitted an abstract titled "Train Where You Test", to the ITEA Workshop, 8 – 10 November 1999, Koloa, Kauai, Hawaii. The abstract was accepted by the reviewing committee and will be used as a back-up presentation in one of the session or it will be presented as a poster paper during the workshop.

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